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INSECTS ASSOCIATED WITH PAPAYA VIRUS DISEASES
Luis F. Martorell and José Adsuar 319

THE INSECTS OF BARBADOES.....*R. W. E. Tucker* 330

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INSECTS ASSOCIATED WITH PAPAYA VIRUS DISEASES IN THE ANTILLES AND FLORIDA[1]

Luis F. Martorell[2] and Jose Adsuar

Introduction

Papaya (*Carica papaya* L.) is native to the American Tropics, its point of origin being as yet unknown. Facts tend to demonstrate that the southern part of Mexico is the original home of this fruit. Today this plant is distributed throughout the tropical and semitropical areas of the world.

Botanically, *Carica papaya* L., is the type species of the Family Caricaceae, within the Order Passiflorales. According to Britton (15)[3] the family is composed of two genera: *Carica* and *Jacaratia*. *Carica* is native to the American Tropics and semitropics from Mexico to Paraguay, while *Jacaratia* occurs not only in America but also in Africa. According to Harms (24) the Caricaceae are divided into four genera as follows: 1, *Carica*; 2, *Mocinna*; 3, *Jacaratia*; 4, *Cylicomorpha*. The first three belong to tropical America, particularly Mexico, and *Cylicomorpha* had its original habitat in Africa.

Within the past few years papaya cultivation has made great progress among farmers in the Antilles and Florida, because of the versatile character of the fruit. Papaya is not only a source of food, but has many uses in industry and in medicine. Wolfe and Lynch (34) discussed the uses of papaya in a recent publication.

Papayas are good sources of vitamins A, B, C, G. The fruit can be used for salads, pies, jams, and preserves. The green fruit yields a digestive enzyme, papain, which is a commercial product. The latex of the fruit is used as a meat tenderizer and the pulp as an ingredient for cosmetic products.

The Agricultural Experiment Station of the University of Puerto Rico has been interested in papaya culture for many years. Studies with this

[1] This paper was presented at the joint meeting of the American Association of Economic Entomologists and the Entomological Society of America, December 10, 1951, Cincinnati, Ohio.

[2] Entomologist and Plant Pathologist, respectively, Agricultural Experiment Station, University of Puerto Rico, Rio Piedras, P. R.

[3] Numerals in parentheses refer to Literature Cited, pp. 328–29

crop were initiated about 20 years ago. More interest was taken when the virus diseases were first observed in the field, and became limiting factors for papaya production in the Island.

History of Papaya Virus Diseases in the Antilles

The first report of a virus disease in papaya was made by the Government Microbiologist at Jamaica, Mr. F. E. V. Smith (32). He reported as follows:

> Throughout the Island, papaws are subject to a disease but this trouble is most noticeable on the Liguanea Plain. The plants are attacked at all ages, but more often the symptoms do not appear until the tree is about reaching the bearing stage. The terminal leaves as they emerge from the bud are yellow and frequently mottled while their size gradually becomes reduced until nothing but a pencil point is left. By the time this stage is reached the larger leaves hang down and gradual death is the result. Usually some adventitious buds lower on the stem start into growth, but the majority of these suffer the same fate, and strong growth is never regained. While root attack is suggested by the symptoms, it has not been possible to associate the symptoms with unhealthy root system and failure to find any organism in the tissues coupled with the mottling suggest that it is a virus disease. It has not been found that the disease is carried in the seed and other methods of transmission of a possible virus are being investigated.

Smith (32) in 1930 mentioned once more that this disease had been a limiting factor to commercial papaya growing in Jamaica. In the same year Ciferri (18) discovered a mosaic disease of papaya in the Dominican Republic. A year later, 1931, Cook (20) reported another virus disease of papaya in Puerto Rico, the first report of a virus disease of papaya recorded from the Island. Cook wrote as follows:

> What appears to be a virus disease of *Carica papaya* L. attacked the plants in the Station grounds a few years ago but the gardener destroyed the plants before the writer could make a study of them. This or a similar disease was later described by Dr. R. Ciferri of Santo Domingo as "curly leaf" but he was uncertain as to the cause. My histological studies indicate that it is a virus disease. The young leaves become more or less curled and in severe cases, this curling persists throughout the life of the plant. The lower leaves become yellow and fall. One or both symptoms may appear on the plants. Some times all the older leaves fall, leaving a cluster or rosette of leaves at the apex. In severe cases the fruits are reduced in number and size.

These reports were followed by additional information on the Jamaica virus published by Edwards (23), Larter (27), and Martyn (28). Reports by Stell (33) in 1937, followed by those of Baker (13) in 1939, concerned the presence of a papaya virus ravaging the papaya plantations of Trinidad. In 1940, Acuña and Zayas (1) described two papaya diseases in Cuba, both apparently caused by a virus. Reports on papaya diseases (26) have been recorded from different parts of the world by many investigators;

however, we shall discuss only the status of these diseases in the Antilles and Florida.

Papaya Virus Disease Investigations in Puerto Rico

After Cook's first report on the presence of a virus disease of papaya in Puerto Rico during 1931, no immediate attempt was made to study it further.

Jensen (10, 11) in 1937 and 1938, while working at the Puerto Rico Agricultural Experiment Station at Mayaguez, studied the "bunchy top" disease, described its symptoms, and made unsuccessful attempts to transmit the virus by mechanical means, budding and grafting. Efforts to transmit the disease by means of the lacewing bug, *Corythucha gossypii* (L.), the stinkbug, *Nezara viridula* (L.), the leafhoppers, *Agalliopsis pepino* (DeLong and Wolcott), and *Nesosteles incisa* (Matsumura) did not succeed. Jensen found a new species of leafhopper breeding on papaya, later named by Oman (29) *Empoasca papayae*. Although Jensen worked with this leafhopper, his experiments were never completed and did not establish the relationship between this insect and the virus.

Alvarez (9) began to study the papaya virus diseases in 1940. He reported the following:

> Experiments were conducted in an attempt to transmit the disease mechanically and with the aid of possible insect vectors. The possibility of the disease being seed borne was considered. Several imported varieties of papayas were tested for resistance.
>
> During the last few years the papaya growing enterprise in Puerto Rico has suffered to a considerable extent due to the mosaic disease. This disease is considered a limiting factor in production. It has been impossible to determine the nature of the malady. All attempts to transmit the disease have been unsuccessful. Inoculated and check plants as well as trees grown from diseased fruit seeds remained symptomless while in the insectary. However, these plants became infected when taken to the field. The possibility of an insect vector is apparent. Wild papayas brought from Panama, Honduras, and Guatemala were found to be as susceptible as our varieties.

Simultaneously with these first investigations Cook and Asenjo (12, 19) were studying the chemistry of virus-infested papaya plants as well as the relations between the total content of protein and papain in papaya. These investigations were not continued until 1945, when the junior writer initiated a new project to study the virus diseases of papaya in Puerto Rico.

In 1945, Adsuar (4, 5, 6) was working simultaneously with bunchy top and the papaya mosaic. He described the mosaic and verified its transmission by the green citrus aphid, *Aphis spiraecola* Patch. In 1946, Adsuar (3) found that *Empoasca papayae* was the insect vector responsible for the transmission of the bunchy top virus. In 1947, Sein (31) confirmed

this. At the same time the writers (8) were investigating the control of *Empoasca papayae* as well as of *Aphis spiraecola*. It was demonstrated that the *Empoasca papayae* is easily controlled by the application of Agricultural Grade DDT to papaya plantations every 15 or 20 days, starting with the first spraying on the papaya seedbed and continuing this spraying on schedule for the entire life of the trees. Experiments to control aphids responsible for the transmission of the mosaic by the use of modern insecticides, including DDT, BHC, and Toxaphene, gave negative results.

During the autumn of 1947 and the winter of 1948, J. S. Caldwell and Martorell (17) made a survey in Puerto Rico and nearby islands to determine whether *Empoasca papayae* had a plant host other than papaya. In 6 months of constant work collecting insects from the lowlands to the highlands it was concluded that *Empoasca papayae* has a single host plant: *Carica papaya*. Collections of *Empoasca papayae* were made once at lights in Río Piedras.

In 1950, the junior writer published a preliminary study (7) on the host range of papaya mosaic in which 49 species of plants representing 21 families were tested. Of these, the wild cucumber or "pepinito", *Melothria guadalupensis* was found susceptible to the papaya mosaic virus. *Melothria* proved to be a symptomless carrier and the virus could not be recovered after 2 months. In 1950, Bird and Adsuar (14) also cooperated in these investigations, particularly on bunchy top. Bird's investigations can be summarized as follows:

> Previous studies gave indications as to the viral nature of papaya bunchy top, but the evidence was inconclusive. Evidence obtained in present studies through the use of the leafhopper, *Empoasca papayae* Oman, associated with the transmission of the disease, was limited by the inability to secure non-viruliferous insect stock cultures. A single leafhopper was capable of transmitting the viral agent. After feeding on healthy plants for a period of one day the disease appeared one and a half months later. Evidence that the causal agent is capable of reproducing within the host plant was demonstrated by transmission of the causal agent in series through one plant after another by grafting. Latex failure to flow, as determined by pricking, shortly follows penetration of downward spread. Affected plants can be cured by cutting back the stem below the infected portion.

Because of discrepancies in the reports of different investigators, particularly in the Antillean Area, it was very difficult to ascertain which disease or diseases of papaya were present in the Antillean Islands. The symptoms described were rather confused and sometimes those of more importance in diagnosing the disease were not discussed. Because of this difference in opinion the writers began a series of trips throughout the Antillean region including Florida. It was the purpose of this investigation not only to determine the status of the existing virus disease of papaay in the Caribbean Area, but to establish the relation of the possible insect vectors to the virus diseases under study.

Status of the Virus Diseases of Papaya and Its Insect Vectors

PUERTO RICO

Two virus diseases of papaya are known to occur in Puerto Rico. These will be referred to hereafter as "bunchy top" and "papaya mosaic". Bunchy top virus is transmitted exclusively by the leafhopper *Empoasca papayae* Oman, while the papaya mosaic virus is transmitted by aphids or plant lice. The disease of papaya previously reported in literature (4) as "dieback", is apparently a form of bunchy top characterized by high virulence on susceptible papaya plants.

Bunchy top is the common papaya disease in Puerto Rico and is found everywhere in the Island from the lowlands to the middle altitudes up to 2,000 feet. Papaya mosaic is limited to a small area around the city of Ponce and the vicinity of Guánica. Why this disease is so limited in distribution is unknown. Both Ponce and Guánica are located on the south coast of Puerto Rico. The authors have never seen papaya mosaic in any other areas than the ones mentioned above.

Empoasca papayae Oman is the sole vector of bunchy top disease of papaya in Puerto Rico. The plant aphid, *Aphis spiraecola* is one of the proven vectors of papaya mosaic in the Island. In preliminary tests the junior writer has transmitted the papaya mosaic by the use of the aphids: *Carolinaia cyperi* Ainslie, *Myzus persicae* Sulzer and *Toxoptera aurantii* Fonscolombe.

Surveys made in Puerto Rico collecting insects on papaya since 1945 to date have demonstrated that *Empoasca papayae* Oman is the only leafhopper breeding on papaya in the Island. Not even by chance have any other leafhoppers been found breeding on this plant. During the spring of 1947 and the winter of 1948 the following insects (17) were collected from weeds and grasses growing under the shade of papaya plantations:

Cicadellidae

Poeciloscarta laticeps Metcalf and Bruner
Hortensia similis (Walker)
Carneocephala sagittifera (Uhler)
Agallia albidula (Uhler)
Deltocephalus sonorus Ball
Deltocephalus flavicosta Stål
Deltocephalus maculellus Osborn
Sanctanus fasciatus (Osborn)
Graminella colonus (Uhler)
Chlorotettix tethys Van Duzee
Chlorotettix minimus Baker
Macrosteles divisus Uhler
Dikraneura delicata Osborn
Typhocybella minima Baker
Empoasca plebeia DeLong and Davidson

Fulgoridae

Bothriocera undata (Fabricius)
Delphacodes propinqua (Fieber)
Delphacodes vaccina Caldwell
Melorminis antillarum (Kirkaldy)

It is interesting to note that, although breeding abundantly on the underbrush in papaya plantations, these insects were never collected on papaya

foliage, not even while resting there. The only insects except *Empoasca papayae*, that have been collected on papaya foliage in Puerto Rico, though they were never found breeding on the papaya themselves, are the leafhopper *Poeciloscarta laticeps* Metcalf and Bruner, and the fulgorids, *Oliarus complectus* Ball and *Omolicna puertana* Caldwell.[4] *O. puertana* is the most common fulgorid found on papaya in Puerto Rico. Whether it breeds there has never been verified.

In October 1946, Martorell and Francisco Seín visited Vieques Island and made a thorough survey of the insects affecting papaya there. During a 4-day survey only the leafhopper *Empoasca insularis* Oman was collected. No virus disease of papaya was found in Vieques Island. Papayas were perfectly healthy except for a serious outbreak of the disease known as *Phytophtora* rot, which ravaged the papaya plants during that time.

Vieques Island was visited once more by Martorell and Caldwell and a thorough search was made from October 22 to October 25, 1947. The only insects collected on papaya foliage at that time were the fulgorids *Oliarus complectus* Ball and *Sanctanus fasciatus* Osborn and one male adult of the leafhopper, *Empoasca canavalia* DeLong, which came from a small plant in a papaya seedbed. At this time no virus disease of papaya was seen in this locality.

VIRGIN ISLANDS

From December 16 to 19, 1946, the writers visited the islands of St. Thomas and St. Croix (Virgin Islands) and collected extensively throughout them. No virus disease of papaya was recorded during this survey. The only insects collected from papaya foliage in St. Thomas were the following:

Empoasca fabae (Harris)
Empoasca dilitara DeLong & Davidson
Empoasca sp.
Dikraneura sp.
Ormenis quadripunctata (Fabricius)
Aphis spiraccola Patch

Only one species of *Empoasca*, apparently a new one, was found breeding in the Island of St. Croix. The senior writer once more visited St. Thomas in June 1949, and later on during September 1951. The status of the papaya diseases in this island remained the same: No virus disease of papaya was present.

SANTO DOMINGO

On September 1950, the senior writer visited the Dominican Republic, staying at San Pedro de Macorís through the kind hospitality of Mr. Jorge

[4] *Omolicna puertana* Caldwell was described by J. S. Caldwell (17). All previous Puerto Rico records under *Phaciocephalus cubanus* Osborn belong under this new name.

Serrallés. The writer had an opportunity to made a 3-day survey on papaya plantations around San Pedro de Macorís and vicinity. In Hacienda Las Cabullas, on the property of Mr. Serrallés, 60 percent of the papaya plants in a 2-acre plantation were infested by bunchy top disease. Leafhoppers were breeding profusely on papaya trees and, after collection and identification, were found to be the common *Empoasca papayae* Oman. No mosaic disease was noted in the area at this time.

During November 1950, the writers once more visited the Dominican Republic and made a thorough survey around Ciudad Trujillo, Villa Duarte, Boca Chica, Haina, and San Cristobal. Leafhoppers were collected in all this area. Every single specimen was identified as *Empoasca papayae* Oman. The only disease present in this area was bunchy top producing exactly the same symptoms as the bunchy top found in Puerto Rico.

HAITI

The trip was continued to Port-Au-Prince, Haiti. A survey was made around papaya plantations in the vicinity of Port-Au-Prince, Damien, Petionville, Tcholand, Leogane, Grand-Goave, and Petit-Goave. The only insect found breeding on papaya during this survey was the leafhopper, *Empoasca papayae*. The only virus disease of papaya observed in Haiti was bunchy top.

CUBA

From Haiti the authors went to Camaguey, Cuba, on November 18, 1950. Around the Camaguey airport and in the city of Camaguey proper leafhoppers were collected from papayas and, at the same time, the presence of the bunchy top disease was observed. The leafhoppers were the common *Empoasca papayae*. Later in the afternoon the writers went to Havana, Cuba. On Monday, November 20 the Experimental Agronomic Station at Santiago de las Vegas was visited. During the trip a very large papaya plantation of around 30 acres was visited, (Hacienda Bijirita, property of Mr. Andrés Hernández) and proved to be 100-percent infested by the papaya mosaic. Leafhoppers were collected there while breeding abundantly on the papaya trees. They were identified as *Empoasca dilitara*. During this visit collections were made at Santiago de las Vegas, Bauta, Artemisa, Baracoa, Guanajay, and Porvenir. Except for Hacienda La Bijirita where the papaya mosaic was very abundant, the only disease observed was papaya bunchy top. Leafhoppers collected at Baracoa and Bauta and the other localities mentioned above were identified as *Empoasca papayae*. These collections were made from bunchy top-diseased trees as well as from healthy trees near diseased ones.

During October 1949, the senior writer had visited Cuba and collected

leafhoppers from papaya at Guanabacoa near Havana. These were identified as *Empoasca papayae* and *Empoasca dilitara*. The insects were collected from apparently healthy trees. Bunchy top was noticed at Guanabacoa, but no leafhoppers were breeding on those trees at that time. No mosaic was observed in this area, although Guanabacoa is close to El Cotorro where the mosaic disease of papaya was reported for first time in Cuba. *Empoasca fabae* (Harris) had been reported by Bruner et al. (16) and later by Acuña and Zayas (2), as breeding on *Carica papaya* in Cuba. The authors did not find this species breeding on papaya in collections in Cuba. Although this is the most common species of leafhopper in Puerto Rico, and has been recorded from 15 or 20 host plants, it has not been found on papaya foliage in the Island during 6 years of constant search for papaya insects.

The work of Acuña and Zayas (2) is among the best published in the Antilles regarding the papaya virus diseases. The authors clearly recognized the difference between the papaya mosaic and our common bunchy top. They called bunchy top, mosaic of the type A, and our common mosaic was identified by them under the name "Mosaico del Cotorro", or type B mosaic. The descriptions of the diseases in this work are very accurate and the present writers consider this publication as basic on papaya virus diseases. However, at that time the vectors of these diseases were not determined, and Acuña and Zayas apparently were not sure of the identity of the vectors of these virus diseases.

FLORIDA, U. S. A.

From Cuba the authors went on to Florida and, between November 23 and 27, made a survey around Miami and vicinity, Homestead, Hollywood, West Palm Beach, and Vero Beach. Leafhoppers were collected from papaya trees in Miami University Campus, Miami, and at Hollywood. These were identified as *Empoasca dilitara* DeLong and Davidson. Aphids were abundant on papaya throughout the area. Collections were made in the above-mentioned places and the aphids were identified as: *Aphis spiraecola* Patch, *Aphis gossypii* Glover and *Rhopalosiphum prunifoliae* (Fieber).

The only disease of papaya observed in Florida was the common papaya mosaic. No bunchy top was found in the localities visited. Near West Palm Beach a leafhopper was collected from a tree showing symptoms like those of bunchy top, but not quite typical of the disease. The insect was identified as *Idona* sp.

Empoasca papayae has never been recorded from Florida. Poos and Wheeler (30) have recorded *Empoasca plebeia* DeLong and Davidson[5] and

[5] For the original description of *plebeia*, *dilitara*, *fabae*, and *solana* see Literature Cited 22, 22, 25, and 21 respectively.

Empoasca dilitara DeLong and Davidson from nymphs collected from papaya foliage in Florida. *Empoasca solana* DeLong and *Empoasca fabae* (Harris) were also recorded from papaya foliage, but the origin of the papaya plants is not mentioned by the authors.

Dr. John S. Caldwell, entomologist from Circleville, Ohio, reported *Empoasca dilitara* from papaya growing spontaneously along the shores on Boca Chica Key, Vaca Key, and Grassy Key. All these collections were made in the Florida Keys during January and February 1951. *Empoasca plebeia* was also collected on papaya at Vaca Key. No papaya mosaic was recorded by Dr. Caldwell while collecting throughout the Keys at that time.

JAMAICA, B. W. I.

During December 1951, the senior author, accompanied by Mr. Julio Bird, made a 3-day survey on Jamaica to investigate the status of the virus diseases of papaya in that territory. The southern coast of Jamaica from Port Royal, Kingston, Hope, Spanish Town, Indian Village, Old Harbor, Porus, and Mandeville was studied and collections of leafhopper were made at different places. This trip was made possible by the courtesy of Mr. Robert Buhrer, General Manager of Shell Co., West Indies Ltd. of Jamaica. We were accompanied by Mr. Michael Fawcus, in charge of agricultural products for the Shell Oil Co. Bunchy top was the only virus disease of papaya observed during the survey; no mosaic of papaya was noticed in the area under study. All the leafhopper material collected at the different localities visited was identified by Dr. David Young of the U. S. National Museum, Washington, D. C., as *Empoasca papayae* Oman.

Papaya trees were scarce in the area surveyed. No doubt bunchy top has considerably diminished papaya growing in this area of Jamaica. Only one winged aphid specimen was collected during our survey. This was at the Mandeville Hotel. The insect was identified as *Aphis spiraecola* Patch, by Miss Louise Russell of the U. S. National Museum, Washington, D. C.

Conclusions and Summary

The bunchy top disease of papaya is found wherever its insect vector, *Empoasca papayae* Oman, occurs: Puerto Rico, Santo Domingo, Haiti, Jamaica, and Cuba. The Virgin Islands (St. Thomas and St. Croix), Vieques, and the State of Florida, appear so far to be free from this disease.

The role of *Empoasca dilitara* as a vector of bunchy top should be studied in Cuba, since it occurs there along with *E. papayae*. *E. dilitara* is common in Puerto Rico, but has never been collected from papaya.

Papaya mosaic is found in Puerto Rico, Cuba, and Florida. This disease is transmitted by various species of plant aphids. The symptoms of the

disease are similar in all the areas studied, but whether the same virus occurs in all three places must be determined by further investigations. *Aphis spiraecola* Patch is a potent vector of papaya mosaic in Puerto Rico. The role of the aphids found in papaya in Cuba and Florida should be further investigated.

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THE INSECTS OF BARBADOS

R. W. E. Tucker[1]

Introduction[2]

Barbados is of the greatest entomological interest to Puerto Rico, not only because many of its insect pests are the same as those found in Puerto Rico, but also because some outstanding differences in insect fauna occur. Because of a most stringent and well-enforced quarantine, the "piche" of sweetpotatoes, *Cylas formicarius* Fabricius, does not occur in Barbados, but a quite similar tuber borer, the "scarabee", *Euscepes postfasciatus* Fairmaire (= *E. batatae* Waterhouse) is a major pest in Barbados, yet, although present in Puerto Rico, is so scarce that no recent collections have been made here. The same species of vaquita, *Diaprepes abbreviatus* Linnaeus, occurs in both Puerto Rico and Barbados, although the species of *Diaprepes* present in the islands of the Lesser Antilles between Puerto Rico and Barbados are quite distinct and obviously and conspicuously different.

The insect pests of cotton are identical in the two islands, and presumably invasions of the moths of *Alabama argillacea* Hübner could be anticipated in Puerto Rico if outbreaks of its caterpillars in the cotton fields of Barbados were promptly reported. Both Barbados and Puerto Rico have similar white grub problems from endemic species of May beetles, and in both islands, the introduced Surinam toad, *Bufo marinus* Linnaeus, is the principal agent in natural control. In both islands, the endemic white grubs are also parasitized by endemic species of *Tiphia*, the Barbadian species being of appreciable economic importance as compared with the scarcity of the one in Puerto Rico which has not been abundant since the time of Gundlach. The "cucubano" of Puerto Rico, *Pyrophorus luminosus* Illiger, an important predator on white grubs before the introduction of the Surinam toad, has become established in Barbados, but a Barbadian lady-beetle, *Hyperaspis trilineata* Mulsant, feeding on the mealybugs of sugarcane, and preferring to live under sugarcane leaf sheaths, has not become established in Puerto Rico despite repeated introductions. The parasitic wasp, *Tetrastichus haitiensis* Gahan, the major factor in the natural control of the "vaquita" or sugar-cane weevil root-stalk borer, *Diaprepes abbreviatus* Linnaeus, in Puerto Rico, has not become established in Barbados despite repeated introductions.

[1] Entomologist, Department of Science and Agriculture, Barbados, British West Indies.

[2] Written by George N. Wolcott, Entomologist Agricultural Experiment Station, University of Puerto Rico, Rio Piedras, P. R.

In some cases we may be able to surmise the reasons for the success or failure of parasite introductions, or why the same insect is present, or not, in the two islands, but it is important to have a record of the known insect fauna of both that a direct comparison may be made. Mr. Tucker has been Entomologist in Barbados for many years, and although working primarily on economic problems, during that extended period has been able to accumulate the following records, admittedly not complete or exhaustive, but of the greatest value to his fellow entomologists, not only in Puerto Rico, but everywhere in the world.

ARACHNIDA

Superfamily—Ixodoidea

Argas miniatus Koch
Found on poultry.

FAMILY—IXODIIDAE

Boöphilus (or **Margaropus**) **annulatus** Say var. **microplus** (Can.)
Found on cattle.

Rhipicephalus sanguineus Latreille
Found on dogs.

FAMILY—DERMANYSSUS

Dermanyssus gallinae Linnaeus
Found on poultry.

FAMILY—ACARIDAE

Tyrophagus (= **Tyroglyphus**) sp.
Attacking seeds of Indian corn, *Zea Mais*, and also the larvae of *Clemora* (*Phytalus*) *smithi* Arrow kept in tins for experimental purposes.

FAMILY—CUNAXIDAE

Cunaxa sp.
Found on cane leaves and suspected of sucking or damaging eggs of *D. saccharalis*.

FAMILY—ERYTHRAEIDAE

Atomus sp.
This identification has since been stated to be probably any genus in family and that this (*Atomus*) is a larval genus of *Trombidiidae*. Definitely known to suck contents of eggs of *D. saccharalis* in canefields.

FAMILY—ORIBATOIDEA

Genus unknown

These mites were found on stem of shaddock, *Citrus decumana*, associated with *Chionaspis citri*. The mites of this family are vegetable feeders, but probably not of economic importance.

INSECTA

ORDER—THYSANURA

FAMILY—LEPISMIDAE

Lepisma saccharina Linnaeus

Infests books, papers, photographs etc., a common household pest.

ORDER—DERMAPTERA

FAMILY—FORFICULIDAE

Doru lineare Esch

Found in leaf sheaths of sugarcane and also in stems of old canes badly damaged by moth borer.

FAMILY—LABIDURIDAE

Anisolabis maritima Géné

Record only.

Euborellia janierensis Dohrn

West Indian records of *Janierensis* actually apply, in many cases, to other species, due to misidentification.

ORDER—ORTHOPTERA

FAMILY—BLATTIDAE

Aglaopteryx diaphana Fabricius

Record only.

Supella supellectilium Serville

Record only.

Blatella conspersa Brunner

This record is correct, but proper use of name now uncertain.

Blatella germanica Linnaeus

Common in cupboards, drawers etc.

Chorisoneura barbadensis Rehn and Hebard

Record only.

Ischnoptera rufa rufa DeGeer

Found in canefields occasionally.

Periplaneta australasiae Fabricius

Frequents houses and ships.

ORDER—ORTHOPTERA (Cont'd)

FAMILY—BLATTIDAE

Leucophaea maderae Fabricius
Found in trash heaps, canefields, outhouses etc.
Panchlora cubensis Saussure
Record only.
Pycnoscelus surinamensis Linnaeus
Frequents canefields.

FAMILY—MANTIDAE

Lobocnema lobipes
Record only.
Musonia surinama Saussure
Found in houses.

FAMILY—PHASMATIDAE

Bostra maxwelli Redtenbacher
These insects feed on plant leaves.
Calynda keratosqueleton Olivier
Record only.
Clonistria linearis Drury
Record only.

FAMILY—ACRIDIDAE

Orphulina balloui Rehn
Frequents grasslands.
Orphulella punctata DeGeer
Record only.
Schistocerca pallens Thunberg
Eats leaves of sugarcane, cotton etc.

FAMILY—TETTIGONIIDAE

Neoconocephalus triops Linnaeus
Frequents grass pastures.
Neoconocephalus maxillosus Fabricius
Record only.
Turpilia punctata Stål
Record only.
Xerophyllopteryx fumosa Bruner
Record only.

ORDER—ORTHOPTERA (Cont'd)

FAMILY—GRYLLIDAE

Acheta assimilis Fabricius
Record only.

Amphiacusta cariabea Saussure
Record only.

Orocharis antillarum Saussure
Record only.

Gryllotalpa hexadactyla Perty
Record only.

Scapteriscus variegatus Burmeister
Specimens taken under a dripping tap, also in a muddy situation.

ORDER—ISOPTERA

FAMILY—TERMITIDAE

Coptotermes havilandi Holmgren
Causes considerable damage to buildings in Bridgetown.

Coptotermes marabitanus Hagen
(Probably *C. havilandi* according to A. M. Adamson. If so, this might indicate the source of introduction of *C. havilandi*, for the record was prior to 1928. The species has since then *not* been found in sugarcane, but only in Bridgetown; even now (1941) planters are seldom cognizant of the fact that wood ants damage sugarcanes. The species so far found almost universally in canefields, is *Nasutitermes costalis*). Taken from a single sugarcane sent to the Office badly eaten into by large members of the species.

Cryptotermes brevis Waker
Dry-wood termites less serious (1941) than *C. havilandi*.

Eutermes haitiensis Holmgren
(Probably *Nasutitermes costalis* (see A. M. Adamson's letter, 1st November, 1934). Similarly with *Eutermes morio* Latreille.)
Found attacking sugarcane on a fairly large area on one plantation where old megass which was attacked had been placed on the fields; also found in buildings on the same plantation.

Heterotermes tenuis Hagen
Also causes damage in buildings.

Kalotermes sp.

Neotermes sp.

Nasutitermes costalis Holmgren
In canefields, mahogany woods etc.

Rhinotermes nasutus Perty
(Record suspect by A. M. Adamson.)
Attacking woodwork of buildings.

Order—Mallophaga

Lipeurus polytrapezius Nitzsch
Taken from domestic fowl.
Lipeurus tropicalis Peters
Taken from domestic fowl.
Ricinus sp. (near **angulatus** Kellogg)
Taken from *Tyrannus dominicensis.*
Menopon gallinae Linnaeus
Found on poultry.
Goniocotes gigas Taschenberg
Found on poultry.

Order—Odonata

Erythrodiplax umbrata Linnaeus
Record only.
Lepthemis vesiculosa Fabricius
Record only.
Orthemis sulphurata Hagen
This identification is doubtful.
Pantala flavescens Fabricius
Record only.
Tramea abdominalis Rambur
Record only.
Ischnura ramburii Selys
Record only.

Order—Neuroptera

family—chrysopidae

Chrysopa sp.
Feeds on plant lice, white flies etc.
Chrysopa antillana Navas
Record only.
Chrysopa exterior Navas
Record only.

Order—Thysanoptera

Corynothrips stenopterus Williams
Cassava.
Dendrothripoides ipomeae Bagnall
Specimens from sweetpotato. Confined apparently to *Ipomaeae.*
Frankliniella melanommata Williams
Frankliniella (Euthrips) insularis Franklin
Attacks leaves of many plants.

ORDER—THYSANOPTERA (Cont'd)

Heliothrips haemorrhoidalis Bouché
Attacks leaves of fiddlewood, *Citharexylum quadrangulare*. Also mango. This species has legs all yellow.

Hoplandothrips xanthopoides Bagnall
Attacks leaves of cassava.

Selenothrips (Heliothrips) rubrocincta Giard
Attacks grape vine, croton, mango. This species has darker legs.

Thrips tabaci Lindeman
Attacks onion and eschalot.

ORDER—ANOPLURA

Solenoptes capillatus Enderlein
Found on cattle.

ORDER—HOMOPTERA

FAMILY—CICADELLIDAE

Hortensia similis Walker
Caught abundantly at light traps, Codrington, 1.3.1929.

Baldulus maidis Delong & Wolcott
Ex. maize at Codrington.

Balchutha sp.
Found on *Zea mays* Linnaeus.

Empoasca sp.
From leaves of English lettuce, *Lactuca sativa*.

Empoasca fabae Harris
Ex. pigeon peas at Codrington and elsewhere.

Empoasca solana DeLong
On sweetpotato vines (becoming very prevalent 1940.41)

Empoasca sp.
On okra at Eastpoint. Suspected of causing browning of leaves and stunting.

FAMILY—DELPHACIDAE

Delphax saccharivora Westwood
This is a minor pest of sugarcane, its eggs being parasitised to a very large extent by the Mymarid *Anagrus flavescens* Waterhouse.

Peregrinus maidis Ashmead
This is a minor pest of maize, sorghum etc.

ORDER—HOMOPTERA (Cont'd)

FAMILY—ALEYRODIDAE

Aleurodicus cocois Curtis
White fly on coconut and other palms.
Dialeurodes citrifolii Morgan
Found on citrus trees.

FAMILY—APHIDIDAE

Sipha flava Forbes
On leaves of sugarcane.
Aphis gossypii Glover
Attacks cotton, melon, and okra.
Aphis maidis Fitch
Taken on sorghum sp., Imphee etc.
Myzus persicae Sulzer
Taken from cabbage.

FAMILY—COCCIDAE

Icerya purchasi Maskell
On casuarina and other garden plants. First found around 1938, had increased 1941. Also on citrus and flowering pea tree. Under control by *Rodolia cardinalis*, 1943–8.
Asterolecanium pustulans Cockerell
From Bougainvillea.
Pseudococcus sp.
(Probably related to *P. inquiliniss*). Found under bark of tree tended by ant *Crematogaster*.
Trionymus sacchari Cockerell
Mealybug on sugarcane.
Ferrisia virgata Cockerell
From tomato plants.
Geococcus radicum Green
From roots of shaddock, *Citrus decumanus*.
Vinsonia stellifera Westwood
On coconut, citrus, and other plants.
Coccus hesperidium Linnaeus
Record only.
Coccus viridis Green
Found on citrus trees frequently.
Saissetia nigra Nietner
On citrus and flowering pea trees.

ORDER—HOMOPTERA (Cont'd)

FAMILY—COCCIDAE

Diapis echinocacti opuntiae Cockerell
On cactus.
Lepidosaphes alba Cockerell
On cassava.
Lepidosaphes beckii Newman
Found on citrus trees frequently.
Aulacaspis rosae Bouché
Common on mango leaves.
Aspidiotus cydoniae Comstock
On oleander.
Aspidiotus destructor Signoret
Found under bark of tree tended by ant *Crematogaster.*
Aspidiotus longispina Morgan
Found on papaw trees, *Carica papaya* Linnaeus.
Selenaspidus articulatus Morgan
Found on citrus trees.
Aonidiella comperei McKenzie
Found under bark of tree tended by ant *Crematogaster.*
Pseudaonidia trilobitiformis Green
Found on citrus trees fairly frequently.
Chrysomphalus aonidium Linnaeus
Found on citrus trees.

ORDER—HEMIPTERA

FAMILY—CIMICIDAE

Cimex lectularius Linnaeus
Record only.

FAMILY—PENTATOMIDAE

Edessa meditabunda Fabricius
Found on many plants, including cotton and cordia.
Mormidea ypsilon Linnaeus
Record only.
Nezara viridula Linnaeus
Habits similar to *Edessa.*

FAMILY—COREIDAE

Leptocorisa filiformis Fabricius
Caught on *Coccoloba uvifera.*
Leptocorisa tipuloides DeGeer
Record only.

ORDER—HEMIPTERA (Cont'd)

FAMILY—COREIDAE

Phthia picta Drury

This is a reddish bug, sometimes a pest of tomato plants; it commonly occurs on various weeds in large numbers during June and July.

FAMILY—LYGAEIDAE

Oncopeltus fasciatus Dallas

Record only.

Pachybrachius bilobata Say

Taken on *Gossypium barbadense* Linnaeus.

FAMILY—GERRIDAE

Gerris marginata Say

Record only. Determination questionable.

FAMILY—ANTHOCORIDAE

Asthenidea sp.

Found in rooms containing wheat for breeding *Sitotroga cerealella*. Some found most years and suspected of sucking and destroying eggs laid by the moths.

Cardiastethus elegans Uhler

Reared from cotton leaves and stems during close season.

FAMILY—TINGIDAE

Corythaica cyathicollis Costa

Attacks leaves of eggplant *Solanum melongera*.

Corythucha gossypii Fabricius

Larvae attack leaves of *Hibiscus esculentus*; also attacks cassava in considerable numbers.

FAMILY—REDUVIIDAE

Nabis capsiformis Germar

Caught in field plot of flowering alfalfa, *Medicago sativa*.

Sirthenea stria Fabricius

Found in house at Worthings. Det. as known from Lesser Antilles, Venezuela and Central America. Is not known to bite man, unless provoked.

Triatoma sanguisuga Leconte

(This probably should be changed to *rubrofasciata* (Degees).) Apparently there are no authentic records of *sanguisuga* from the West Indies. Blood-sucking cone-nose bug, sometimes found in houses.

ORDER—COLEOPTERA

FAMILY—CICINDELIDAE

Cicindela suturalis Fabricius

Found on the sea beach, Maxwell coast.

FAMILY—CARABIDAE

Apenes marginalis Dejean

Record only.

Galerita unicolor Latreille & Dejean (listed as **beauvoisi** Chaudoir by Blackwelder 1944–69)

Record only.

Harpalus sp.

Record only.

FAMILY—DYTISCIDAE

Eretes stictica Linnaeus

Record only.

Megadytes giganteus Castelnau

Larvae feed on tadpoles of Giant toad, *Bufo marinus*, and are a serious factor in limiting the numbers of this beneficial toad.

FAMILY—STAPHYLINIDAE

Oligota oviformis Casey

Larvae feed on eggs of red spider. Identification unlikely, unless this is an introduced species. Most probably the species is *L. parva* Kraatz.

Carpelimus aridus DuVal

Specimens in the British Museum from northern Barbados.

Dr. Richard E. Blackwelder, in his "Monograph of the West Indian Beetles of the Family Staphylinidae", U. S. National Museum Bulletin 182, pp. 658, Washington, D. C., 1943, records collection by himself of the following species of Staphylinidae in Barbados:

Carpelimus correctus Blackwelder, TYPE from St. Lucia

Three Barbadian collections.

Carpelimus flavipes Erichson, TYPE from St. John

One Barbadian collection, in dung.

Oxytelus incisus Motschulsky

Five Barbadian collections. "This is probably the commonest and most wide-spread staphylinid in the West Indies and will undoubtedly be found on all the islands where cattle and horses are kept. I have collected it from dung, manure, excrement, and bat guano, flying at dusk and on muddy banks of ponds". Blackwelder 1943-98.

Platystethus spiculus Erichson

One Barbadian collection.

ORDER—COLEOPTERA (Cont'd)

FAMILY—STAPHYLINIDAE

Lithocharis limbata Erichson
Five Barbadian collections.
Lithocharis ochracea Gravenhorst
Cosmopolitan, two Barbadian collections.
Lithocharis sororcula Kraatz
Three Barbadian collections.
Scopaeus pygmaeus Erichson, TYPE from Puerto Rico
One specimen in the British Museum.
Erichsonius humilis Erichson, TYPE from Puerto Rico
One Barbadian collection.
Philonthus ventralis Gravenhorst
Cosmopolitan, seven Barbadian collections.
Cafius bistriatus Erichson, TYPE from Long Island, New York
From under seaweed at three localities on the beach at Barbados.
Diochus nanus Erichson
Cosmopolitan, collected at two Barbadian localities under cane trash.
Leptacinius parumpunctatus Gyllenhal
Cosmopolitan, two Barbadian collections, under dung.
Xantholinus attenuatus Erichson, TYPE from St. Thomas and Puerto Rico
Eight Barbadian collections.
Leucoparyphus silphoides Linnaeus
Cosmopolitan, one Barbadian collection, under dung.

FAMILY—HYDROPHILIDAE

Hydrophilus ater Olivier (listed as **insularis** Laporte, Blackwelder 1944-171)
Larvae feed on tadpoles of *Bufo marinus*.
Tropisternus apicipalpia Chevrolat
Tropisternus lateralis Fabricius
Dactylosternum abdominale Fabricius (listed by Blackwelder 1944-170 to 173)

FAMILY—SCARABAEIDAE

Aphodius cuniculus Chevrolat
Ataenius beattyi Chapin
Ataenius edwardsi Chapin
Ataenius frater Arrow
Ataenius gracilis Melsheimer

ORDER—COLEOPTERA (Cont'd)

FAMILY—SCARABAEIDAE

Ataenius luteomargo Chapin

Ataenius miami Cartwright

Ataenius strigicauda Bates (listed by Blackwelder 1944-212 to 215, after Dr. E. A. Chapin's *A Revision of the West Indian Beetles of the Scarabaeid Subfamily Aphodiinae*, Proc. U. S. National Museum, **89** (3092): 1–41. Washington, D. C., May 23, 1940.)

Clemora (or **Phytalus**) **smithi** Arrow

Larvae injure roots of sugarcane, rose trees, citrus, palms, bananas; adults found at night on sugarcane, rose trees, cassava, bananas. The leaves of rose trees are often badly eaten by the adults.

Cyclocephala signata Drury

Record only.

Ligyrus cuniculus Fabricius

Larvae found in decaying vegetable matter. Adults fly to the lights in houses.

Trox suberosus Fabricius

Feeds on carcasses, hides, hoofs etc.

Phileurus valgus Linnaeus

Record only.

FAMILY—ELATERIDAE

Chalcolepidius porcatus Linnaeus

Taken from and destroying whitewood tree. Also from imported wallaba wood.

Heteroderes lauranti Guérin-Méneville

From imported wallaba wood, probably from Demerara, 1929.

Pyrophorus luminosus Illiger

Introduced in 1935 (3,670 larvae) and previously in 1932 (1,200 adults) from Puerto Rico. Successfully established and still to be found in wetter, hillier regions of Barbados, where there is more tree growth. Numbers still found in May–June, 1951.

FAMILY—BUPRESTIDAE

Chrysobothris sexpunctata Fabricius

Imported in firewood.

Chrysobothris antillarum Fisher 1925-101: TYPE from Barbados

Described from a single specimen collected by Dayton Stoner, May 11, 1918, at Bridgetown.

ORDER—COLEOPTERA (Cont'd)

FAMILY—CLERIDAE

Necrobia rufipes DeGeer

On empty copra bags; probably imported with copra to Barbados 1940–41.

FAMILY—OSTOMIDAE

Tenebriodes mauritanicus Linnaeus

Found in sacks of peanuts from India.

FAMILY—DERMESTIDAE

Attagenus gloriosae Fabricius

Found on vanilla beans from Trinidad, 1928. Also found in various habitats in Barbados.

FAMILY—BOSTRICHIDAE

Amphicerus (Schistocerus) cornutus Pallas

Specimens from a wood dealer.

Heterobostrychus aequalis Waterhouse

Adults similar to *S. anale*.

Sinoxylon conigerum Gerstaecker

Adults, pupae, and larvae in wooden cases shipped direct from India.

Tetrapriocera longicornis Olivier

Hatched from ebony wood.

FAMILY—ANOBIIDAE (PTINIDAE)

Catorama herbarium Gorham

Eats into books, upholstered furniture, provisions, etc.

Catorama zeae Waterhouse

Listed by Blackwelder 1945-406.

Stegobium panicea Linnaeus

Attacking onion seed from Teneriffe. Cosmopolitan pest of stored foodstuffs.

FAMILY—LYMEXYLONIDAE

Atractocerus brasiliensis Laporte and Serville

Black borer of ebony, *Albizzia Lebbek* Bentham.

FAMILY—NITIDULIDAE

Carpophilus dimidiatus var. **mutilatus** Erichson

Collected on imphee leaves around decayed material.

Haptoncus luteola Erichson

Found in decaying mango.

ORDER—COLEOPTERA (Cont'd)

FAMILY—CUCUJIDAE

Oryzaephilus surinamensis Linnaeus
Infesting sugar. Barbados.

FAMILY—COCCINELLIDAE

Azya trinitatus Marshall
Introduced in large numbers (3,000 or 4,000) from Trinidad to control *Aspidiotus destructor*. Found on coconut palms weeks after liberation.

Coleomegilla maculata DeGeer
Feeds on aphids, etc.

Cryptognathus nodiceps Marshall
Introduced from Trinidad to control *Aspidiotus destructor* on coconut palms. Reared in captivity in large cage, but not recovered from field.

Cycloneda sanguinea Linnaeus
Feeds on aphids, etc.

Hyperaspis trilineata Mulsant
Found associated with the sugarcane mealybug, on which it feeds.

Rodolia cardinalis Mulsant
Introduced in 1943 from California (via Imp. Inst. Ent. Ontario, Canada) for control of *Icerya purchasi*. Well established in April, 1943.

Scymnus ochroderus Mulsant
Feeds on aphids and white flies.

Pentilia insidiosa Mulsant
Also introduced from Trinidad.

FAMILY—MYCETOPHAGIDAE

Typhaea stercorea Linnaeus
Record only.

FAMILY—RHIPIPHORIDAE

Macrosiagon octomaculatus Gerstaecker
Parasite of *Campsomeris dorsata* Fabricius. Also found on cottony cushion scale, *Icerya purchasi*, apparently feeding on the egg sacs, which it had torn open.

FAMILY—MELOIDAE

Cissites maculata Swederus
Listed by Blackwelder 1945-482.

ORDER—COLEOPTERA (Cont'd)

FAMILY—OEDEMERIDAE

Copidita lateralis Waterhouse
Frequently found at lights.

FAMILY—TENEBRIONIDAE

Alphitobius diaperinus Panzer
Found in decaying cottonseed.

Alphitobius piceus Olivier
From cottonseed, a cosmopolitan species, not infrequently found in flour. Found in wheat in parasite units in 1947, causing considerable damage. Probably came in ships, during war.

Alphitobius laevigatus Fabricius
From cottonseed from Puerto Columbia after fumigation.

Opatrinus gemellatus Olivier
Said to injure young cotton plants in other Islands.

Phaleria chevrolata Fleutiaux and Serville
Caught on Dover Beach, Christ Church.

Schoenicus antillarum Champion
Some specimens found in a cellar; some also found under the bark of a tree.

Tribolium castaneum Herbst
Attacks stored maize, flour, etc.

Zophobas morio Fabricius
Occurs frequently in houses.

FAMILY—CERAMBYCIDAE

Achryson surinamum Linnaeus
Bores into ebony, *Albizzia Lebbek* Bentham.

Chlorida festiva Linnaeus
Bores into ebony, *Albizzia Lebbek* Bentham.

Cylindera flava Fabricius
Caught at light trap. Codrington, February, 1929.

Eburia decemmaculata Fabricius
Taken from borings in Spanish ash tree, Bishop's Court., tree killed by borers and white ants.

Eburia octomaculata Chevrolat
Found at Codrington, July, 1929

Heterachthes quadrimaculatus Fabricius
Record only.

ORDER—COLEOPTERA (Cont'd)

FAMILY CERAMBYCIDAE

Lissonotus shepherdi Pascoe
From imported wallaba wood.

Phryneta verrucosa Drury
Bores into *Ficus lentiginosa* and *F. nitida*.

Polyrraphis spinosa Drury
Record only.

Trachyderus succinctus Linnaeus
Record only.

Lagochirus araneiformis Linnaeus
Record only.

Leptostylus posticalis Gahan
Taken from borings in branch of *Hura crepitans*.

Leptostylus praemorsus Fabricius
Bores into bark of lime and other citrus trees.

Batocera rubus Linnaeus
Recorded by Blackwelder 1946-596 as also from St. Croix and China.

Hypsioma insularis Fisher 1935-199: TYPE from Barbados

Lepturges guadeloupensis Fleutiaux and Sallé
Borings in twigs of mango.

FAMILY—CHRYSOMELIDAE

Lema sharpi Jacquelin-Duval
Found on various weeds.

Myochrous armatus Baly
Larvae found at roots of sugarcane; adults on sugarcane shoots and corn leaves, and eating sweetpotato stems.

Chaetocnema amazona Baly
Flea beetle of sweetpotato

Haltica satellitia Jacquelin-Duval
Feeds on weed *Jussiaea suffruticosa* Linnaeus.

Homophoeta aequinoctialis Linnaeus
Sometimes very numerous on the common weed *Stachytarpheta indica* Vahl.

FAMILY—BRUCHIDAE

Bruchus spp.
Attacking stored seeds, etc.

Bruchidius incarnatus Boheman
In Bonavist beans from Egypt.

ORDER—COLEOPTERA (Cont'd)

FAMILY—BRUCHIDAE

Caryedon fuscus Goerc
An introduced Asiatic species.
Collosobruchus analis Fabricius
In imported peas.
Collosobruchus chinensis Linnaeus
Attacking black-eye peas stored, grown and imported.
Collosobruchus maculatus Fabricius
Reared from imported black-eye peas, known locally as "pope". Probably attacks black-eye peas in field in Barbados. Parasitised by *Bruchobius vagabundus* Timberlake.

FAMILY—SCOLYTIDAE

Coccotrypes thrinacis Hopkins
Boring in seeds of *Thrinax radiata* and *Thrinax argentea*, and found boring into and destroying buttons on a suit (St. Lucy, Barbados). Buttons had been turned out of ivory nuts, *Phytelephas* sp. Species usually associated with this sort of injury is *C. eggersii*. Hagendorn, but present species is smaller and darker.
Cryphalus sp.
Boring in twigs of mango. Also attacks stored sweetpotato seriously. Noted 1930.
Hypocryphalus mangiferae Stebbing
Boring in twigs of mango.
Hypothenemus sp.
Boring in twigs of *Mangifera indica.*
Pycnarthrum pallidum Chapuis
Found in bark of *Artocarpus incisa* and *Ficus nitida.*
Stephanoderes seriatus Eichhoff
Record only.
Xylebrous confusus Eichhoff
Mango.
Xyleborus perforans Wollaston
Attacks acid sugarcane.

FAMILY—PLATYPODIDAE

Platypus punctatus Chapuis
Listed by Blackwelder 1947-790.

ORDER—COLEOPTERA (Cont'd)

FAMILY—CURCULIONIDAE

Artipus corycaeus Sahlberg

Found in pods of *Caesalpinia* sp. and among seeds of *Abrus precatorius* Linnaeus.

Diaprepes abbreviatus Linnaeus

This is a very bad pest of sugarcane; the larvae bore into the cane bases, sometimes completely severing them.

Diaprepes famelicus Olivier, var. **barbadensis** Marshall

Adults found in Barbados feeding on epidermis of Agave leaves.

Euscepes postfasciatus Fairmaire

This is a very bad pest of sweetpotato.

Litostylus bovelli Marshall

Record only.

Metamasius sericeus Olivier

Attacks sugarcane after fermentation has begun, or attacks moth borer damaged cane and produces fermentation and almost complete destruction of attacked cane. Attacks some cane varieties more than others, and damages ratoon stumps. Recorded once (1946) as attacking banana corms and stumps.

Promecops lunatus Fahraeus

Attacks leaves of bean, *Phaseolus lunatus*.

Rhyssomatus nigerrimus Fahraeus

Record only.

Sitophilus granarius Linnaeus

Grain weevil—cosmopolitan.

Sitophilus linearis Herbst

Record only.

ORDER—DIPTERA

FAMILY—CULICIDAE

Aedes aegypti Linnaeus

Record only.

Culex quinquefasciatus Say

Record only.

FAMILY—TIPULIDAE AND PSYCHODIDAE

Genera and species of these families are present in Barbados, but are not on record.

FAMILY—TENDIPEDIDAE

Tendipes spp.

ORDER—DIPTERA (Cont'd)

FAMILY—HELEIDAE

Culicoides sp.
Taken sucking human blood.
Culicoides paraensis Goeldi
Record only.

FAMILY—ITONIDIDAE

Asynapta mangiferae Felt
Attacks mango twigs and also leaves.
Contarinia lycopersici Felt
Cause severe blossom fall in tomatoes in some years.
Porricondyla gossypii Coquillett
Gets into bruises on the stems, lives under the bark and finally causes death of the attacked branches.

FAMILY—SCATOPSIDAE

Scatopse sp.
Collected from soil containing bulbous plants (Liliaceae) imported from United Kingdom.

FAMILY—STRATIOMYIDAE

Hermetia illucens Linnaeus
Frequently found on imphee leaves, okra leaves, etc., evidently following honeydew of aphids. Pupae are flat, grey, segmented (with bristles on segment edges) and mobile.

FAMILY—TABANIDAE

Tabanus hookeri Knab var.
Caught on okra plant.

FAMILY—BOMBYLIIDAE

Geron sp.
Record only.

FAMILY—SYRPHIDAE

Allograpta obliqua Say
Record only.
Tubifera vinetorum Fabricius
Record only.

ORDER—DIPTERA (Cont'd)

FAMILY—DOLICHOPODIDAE

Psilopus chrysoprasius Walker
Frequently seen on plant leaves.
Psilopus unifasciatus Say
Habits similar to the preceding.

FAMILY—EPHYDRIDAE

Leptopsilopa nigrimana Williston
Bred from mines in sweetpotato leaves.

FAMILY—CHLOROPIDAE

Cadrena pallida Loew
Record only.
Hippelates pallidus Loew
From diseased tomato cutting (1934). Probably same species as *H. planiscatellatis.*
Oscinella sp.
On plant leaves.

FAMILY—PHORIDAE

Megaselia sp.
Record only.
Megaselia scalaris Loew
Recorded as in soil; presumably, pupae found in soil.

FAMILY—OTITIDAE

Euxesta annonae Fabricius
Common on plant leaves; same species as *E. eluta* Loew.

FAMILY—LAUXANIIDAE

Sapromyza maculosa Williston
May be same species as *S. macula* Loew. Record only.

FAMILY—CALLIPHORIDAE

Callitroga macellaria Fabricius
Taken on sorghum with honeydew of aphids.
Phaenicia eximia Wiedemann (= *Lucilia ruficornis* Macquart)
Taken on leaves.

ORDER—DIPTERA (Cont'd)

FAMILY—SARCOPHAGIDAE

Sarcophaga chaetopygialis Williston
Caught in field of sweetpotato which was infested with larvae of *Herse cingulata* Fabricius.
Sarcophaga chrysostoma Wiedemann
Record only.
Sarcophaga lambens Wiedemann
Bred from larvae feeding on decaying larva of *Herse cingulata* Fabricius.
Sarcophaga plinthopyga Wiedemann
Record only.
Sarcophaga trivittata Macquart
Record only.
Sarcophaga ventricosa Van der Wulp
Found on *Zea mays*.

FAMILY—LARVAEVORIDAE

Ormia depleta Wiedemann
Caught in house.
Peleteria robusta Wiedemann
Parasitic on *Leucania* (or *Cirphis*) *microgonia* Hampson.
Sturmia distincta Wiedemann
Parasitic on *Herse cingulata* Fabricius
Zygosturmia inca Townsend
Bred from sphingid larvae feeding on sweetpotato.

FAMILY— MUSCIDAE

Atherigona exisa Thomson
Reared from cotton bolls infested with pink bollworm; also possibly from rotten tubers of cassava.
Musca domestica Linnaeus
Housefly.
Stomoxys calcitrans Linnaeus
Record only.

FAMILY—TYLIDAE

Hrallomyia (Calobata or **Taeniaptera) annulata** Fabricius
Occurs along grass paths.

ORDER—DIPTERA (Cont'd)

FAMILY—AGROMYZIDAE

Agromyza sp.
Leaf-miner of cow-pea.

Agromyza sorosis Williston
Bred from young leaves of *Zea Mays* attacked by a leaf-miner.

FAMILY—DROSOPHILIDAE

Drosophila melanogaster Meigen
The "wine fly" of Europe. Bred from decaying mango.

FAMILY—MILICHIIDAE

Milichiella lacteipennis Loew
Taken on leaves of papaw, *Carica papaya*.

ORDER—APHANIPTERA

FAMILY—PULICIDAE

Pulex irritans Linnaeus
Record only.

ORDER—LEPIDOPTERA

FAMILY—NYMPHALIDAE

Agraulis vanillae Linnaeus
Larva feeds on *Passiflora* spp.

Danaus plexippus Linnaeus
Larva feeds on weed *Asclepias curassavica*.

Hypolimnas misippus Linnaeus
Larva feeds on *Portulaca* sp.

Junonia genoveva Cramer
Larva feeds on *Stachytarpheta indica* Vahl.

Vanessa cardui Linnaeus
Record only.

FAMILY—LYCAENIDAE

Hemiargus hanno Stoll
Small blue butterfly, larva feeds on *Phaseolus* sp.

FAMILY—PIERIDAE

Ascia monuste Linnaeus
Larva feeds on cruciferous plants.

ORDER—LEPIDOPTERA (Cont'd)

FAMILY—PIERIDAE

Eurema elathea Cramer
Female similar to above sp. Male small and well coloured.
Phoebis eubule Linnaeus
Larva feeds on *Cassia* spp.

FAMILY—PAPILIONIDAE

Papilio polydamas Linnaeus
Larva feeds on *Aristolochia.*

FAMILY—HESPERIIDAE

Calpodes ethlius Cramer
Attacks canna, arrowroot, and tous-les-mois plants.
Eudamus retracta
Record only. May be *Goniurus dorantes retractus.*
Hylephila phyleus Drury
Record only.
Proteides zestos Geyer
Record only.
Urbanus proteus Linnaeus
Attacks bean plants. (*Phaseolus* sp.).

FAMILY—ARCTIIDAE

Utethesia ornatrix Linnaeus
Feeds on *Crotolaria retusa.*

FAMILY—NOCTUIDAE

Agrotis malefida Guenée
Agrotis subterranea Fabricius
These two species feed on cotton, sweetpotato. Bred from tobacco, soybeans and curcurbits. Also found in soil under tomatoes, causing serious damage to fruits resting on the ground.
Anicla infecta Ochsenheimer
Reared from sweetpotato leaves.
Xanthopastis timais Cramer
Feeds on lily (*Crinum* sp.)
Bagisara subusta Hübner
Reared from larva feeding on *Sida glomerata.*
Cydosia bistrio Fabricius
Feeds on *Spigelia anthelmia* Linnaeus

ORDER—LEPIDOPTERA (Cont'd)

FAMILY—NOCTUIDAE

Elaphria agrotina Guenée

Reared from cotton leaves and stems kept at Laboratory during the close season.

Heliothis armigera Hübner

This is pest of cotton, corn, and tomato.

Heliothis virescens Fabricius

Feeds on pigeon pea, *Cajanus cajan*. Reared from cotton bolls and from tomato; also from larva feeding on rose bushes.

Laphygma frugiperda Smith and Abbot

Besides being a bad pest of Indian corn, is also a minor pest of cotton, injuring the bolls. Reared from curcurbits; bores also into stems of Indian corn and feeds on young ears and tassels. Feeds on shoots of sugarcane.

Leucania microgonia Hampson

Larvae attacking leaves of sugarcane. Reared from larvae at root of sugarcane.

Leucania multilinea Walker

Record only.

Prodenia dolichos Fabricius

Attacks cotton, sweetpotatoes, and many garden plants, also tobacco; caught often at light traps.

Prodenia (Xylomyges) eridania Cramer

Reared from larvae on sweetpotato. Pupae also dug up in sweetpotato fields, September, 1929.

Prodenia sunia Guenée

Feeds on *Zephyranthes* sp., also reared from sweetpotato, October 1928.

Lithoprosopus confligens Walker

Caught at light. Barbados. Recorded also from Dominica.

Meridyrias progenies Guenée

Caught at light in house.

Micrathetis triplex Walker

Reared from sweetpotato leaves.

Alabama argillacea Hübner

This is a common pest of cotton.

Aletia luridula Guenée

This is not as bad a pest of cotton as the preceding. Reared also from tomatoes.

Spragueia dama Guenée

Larvae found eating blossoms of sweetpotato.

ORDER—LEPIDOPTERA (Cont'd)

FAMILY—NOCTUIDAE

Mocis repanda Fabricius
Attacks Guinea grass, *Panicum maximum*; periodic outbreaks occur.

Otosema odorata Linnaeus
Record only.

Platysenta albigera Guenée
Reared from larvae attacking leaves of Chrysanthemum.

Pseudoplusia rogationis Guenée
Feeds on sweetpotato, woolly pyrol and curcurbits.

Ptichodis immunis Guenée
Record only.

Gonodonta nutrix Stoll
Reared from soursop.

Gonodonta famelica Guenée
Feeds on *Leucaena glauca*.

Gonodonta fasciolaris Hübner
Feeds on the leaves of the lignum-vitae, *Guaiacum officinale*.

Anticarsia gemmatalis Hübner
Attacks beans, bonavist, woolly pyrol, and other related leguminous plants.

Argyrogramma verruca Fabricius
Reared from sweetpotato vines; not so numerous as *Xylomyges eridania* Cramer

FAMILY—SPHINGIDAE

Herse cingulata Fabricius
Pest of sweetpotato; periodic outbreaks occur.

Cocytius antaeus Drury
Feeds on plants of *Anonaceae*

Epistor (or **Enyo**) **lugubris** Linnaeus
Feeds on *Vitis* spp. and *Datura* spp.

Erinnyis ello Linnaeus
Feeds on cassava (Manihot); periodic outbreaks occur. Reared from caterpillars from roots of cane.

Erinnyis alope Drury
Feeds on *Hippomane* and *Jatropha*.

Erinnyis obscura Fabricius
Record only.

Pachylia ficus Linnaeus
Feeds on *Ficus nitida* and *Chlorophora tinctoria*.

Pholus fasciatus Sulzer
Feeds on water-hyacinth, *Jussiaea*.

ORDER—LEPIDOPTERA (Cont'd)

FAMILY—SPHINGIDAE

Pholus labruscae Linnaeus
Feeds on *Cissus sicyoides.*

Protambulyx strigilis Fabricius
Feeds on hog plum, *Spondias lutea.*

Protoparce rustica Fabricius
Feeds on wild coffee, *Clerodendron aculeatum.*

Protoparce sexta Johansson
Feeds on Solanaceous plants, e.g. tomato, pepper.

Pseudosphinx tetrio Linnaeus
Feeds on Allamanda or Frangipani, *Plumeria alba.*

Sesia tantalus Linnaeus sub. sp. **zonata** Drury
Record only.

Xylophanes pluto Fabricius
Feeds on *Erythroxylon.*

Xylophanes tersa Linnaeus
Feeds on rose. Reared from milkweed, September, 1928.

FAMILY—SYNTOMIDAE

Syntomeida syntomoides Boisduval
Feeds on *Ipomoea.* Larvae very ornate with long tufts of hair and bristles, etc.

FAMILY—GEOMETRIDAE

Melanchroia cephise Cramer
Caught at *Cordia interrupta* bushes, September 1928. Larva black and yellow. Feeds on *Phyllocanthus* and Barbados gooseberry.

Semiothisa ochrata Warren
Record uncertain.

Synchlora frondaria Guenée
Record only.

FAMILY—URANIIDAE

Urania leilus Linnaeus
Occurs sometimes in Barbados after a gale.

FAMILY—GALLERIIDAE

Corcyra cephalonica Stainton
From bags of cottonseed in hold of steamers. Also reared from chocolate bars from stores, and caught in rooms stored with grain.

Galleria mellonella Linnaeus
The wax moth; a cosmopolitan pest.

ORDER—LEPIDOPTERA (Cont'd)

FAMILY—CRAMBIDAE

Diatraea saccharalis Fabricius
Larvae tunnel shoots and stems of sugarcane.

FAMILY—PHYCITIDAE

Crocidomera sp.
Reared from seed pods of *Swietenia mahagoni* Linnaeus.
Ephestia cautella Walker
Reared from chocolates from stores in town.
Fundella pellucens Zeller
(= **Fundella cistipennis** Dyar)
Attacks and damages pods of pigeon peas, *Cajanus cajan*, and beans.
Hypsipyla grandella Zeller
Bores into shoots of mahogany trees.
Nephopteryx ephestiella Hampson
Reared from tamarind fruits.

FAMILY—PYRAUSTIDAE

Anania florella Cramer
Hosts plants not recorded.
Asciodes anormales Guenée
Feeds on sweetpotato leaves.
Sylepta (or **Asciodes**) **gordialis** Guenée
Feeds on *Bougainvillaea*.
Diaphania sibillalis Walker
Host plants not recorded.
Diaphania hyalinata Linnaeus
Feeds on curcubitaceous plants.
Pyrausta cerata Fabricius
(= **Epicorsia mellinalis** Hübner)
Attacks fiddle-wood, *Citharexylum quadrangulare*.
Hymenia perspectalis Hübner
Host plants not recorded.
Hymenia recurvalis Fabricius
Host plants not recorded.
Hedylepta indicata Fabricius
Feeds on bean leaves.
Psara (or **Pachyzancla**) **bipunctalis** Fabricius
Feeds on many plants: canna, garden beans, swordbeans, etc. Also reared from beet leaves.

ORDER—LEPIDOPTERA (Cont'd)

FAMILY—PYRAUSTIDAE

Pionea cervinalis Warren
Host plants not recorded.

Paradosis flegia Cramer
Host plants not recorded.

FAMILY—COSSIDAE

Xyleutes punctifera Hampson
Larvae tunnel into certain trees, shrubs etc.—*Ipomoea* sp., *Anona muricata*, *Codiaeum* spp., *Tecoma leucoxylon* (whitewood), the last-named tree being specially favored by it, causing large limbs to break off.

FAMILY—GELECHIIDAE

Dichomeris melissia Walsingham
Reared from larva on leaf of potato, *Solanum tuberosum*.

Lecithocera emigrans Meyrick
Reared from leaves of sweetpotato.

Sitotroga cerealella Olivier
Reared from imphee seed; *Andropogon sorghum saccharatus* caught in canefield 1928.

Platyedra gossypiella Saunders
The pink bollworm of cotton.

FAMILY—COSMOPTERYGIDAE

Pyroderces stigmatophora Walsingham
Reared from sorghum seeds and castor-oil seeds.

Pyroderces coriacella Snellen
Reared from larva in cotton kept during "close season" at laboratory.

FAMILY—BLASTOBASIDAE

Blastobasis grenadensis Walsingham
Reared from cotton leaves and stems kept during "close season".

Pigritia troctis Meyrick
Reared from cotton leaves and stems kept during "close season".

FAMILY—HYPONOMEUTIDAE

Plutella maculipennis Curtis
Attacking leaves of cabbage.

ORDER—HYMENOPTERA

FAMILY—BRACONIDAE

Apanteles sp.
Reared from leaves of *Cordia interrupta*, attacked by a leaf-miner.

Apanteles glomeratus Linnaeus
Introduced from Canada to combat larvae of cabbageworm, *Ascia monuste* Linnaeus. Field recoveries made.

Apanteles sp.
Reared from pink bollworm from okra seeds.

Microbracon hebetor Say
Taken from bags of stored cottonseed.

FAMILY—EVANIIDAE

Evania appendigaster Linnaeus
Egg parasite of cockroach.

FAMILY—ICHNEUMONIDAE

Enicospilus sp.

FAMILY—MYMARIDAE

Anagrus flaveolus Waterhouse
Egg parasite of the "cane fly", *Delphax saccharivora* Westwood.

FAMILY—TRICHOGRAMMATIDAE

Trichogramma minutum Riley
Parasitizes many lepidopterous eggs. Found extensively in cane fields, parasitizing eggs of the sugarcane moth-borer, *Diatraea saccharalis* Fabricius. Its mass rearing on *Sitotroga cerealella* Olivier, by making possible mass liberation in young canefields, has proved to be a successful form of biological control of the moth-borer in Barbados.

Trichogramma spp.
Introduced to supplement the above.

FAMILY—EULOPHIDAE, APHELININAE

Aspidiotiphagus citrinus Craw
Reared from *Aulacaspis rosae* Bouché infesting leaves of mango.

Encarsia sp.
Reared from pupae of white flies on guava leaves.

Prospaltella sp.
Introduced for control of *Aleurodicus cocois* Curtis.

ORDER—HYMENOPTERA (Cont'd)

SUBFAMILY—TETRASCHINAE

Tetrastichus hagenowi Ratzenburg

Parasitic on eggs of cockroach.

Tetrastichus haitiensis Gahan

Introduced from Puerto Rico, reared in Barbados and many thousands liberated for control of *Diaprepes abbreviatus* Linnaeus. No recoveries in the field.

SUBFAMILY—ELACHERTINAE

Euplectrus furnius Walker

Reared from larvae of *Herse cingulata* Fabricius found parasitized in a field of sweetpotatoes.

Zagrammosoma sp.

Reared from leaves of *Cordia interrupta* attacked by a leaf-miner.

SUBFAMILY—ENTEDONTINAE

Achrysocharis sp.

Reared from leaf-miners in sweetpotato leaves.

FAMILY—ENCYRTIDAE

Ageniaspis (Holcothorax)

Parasitic on larvae of *Nephopteryx* (or *Anypsipla*) *ephestiella* Hampson reared from tamarind fruits.

Habrolepis sp.

Parasitic on the scale insect *Aspidiotus* (or *Hemiberlesia*) *longispina* Morgan.

FAMILY—EUPELMIDAE

Lecanobius cockerelli Ashmead

Parasitic on black scale, *Saissetia nigra* Nietner.

FAMILY—CHALCIDIDAE

Brachymeria ovata Say

Pupal parasite of *Alabama argillacea* Hübner and *Anticarsia gemmatilis* Hübner.

Brachymeria sp.

Record only.

FAMILY—PTEROMALIDAE

Habrocytus cerealellae Ashmead

Parasitic on larvae of *Sitotroga cerealella* Olivier in moth-breeding units.

ORDER—HYMENOPTERA (Cont'd)

FAMILY—PTEROMALIDAE

Prophanurus alecto Crawford

Parasitizes eggs of *Diatraea saccharalis* Fabricius, but is not common.

Pteromalus puparum Linnaeus

Introduced from Canada and reared in puparia of *Ascia monuste* Linnaeus, several thousand liberated. No recoveries made in the field and it is not known whether it has become established in Barbados.

Bruchobius vagabundus Timberlake—det. A. B. Gahan

Parasitizes "pope" in black-eye peas.

FAMILY—DIAPRIDAE

Trichopria cubensis Fouts

Parasitizes pupae of the Amazon fly, *Metagonistylum minense* TT.

Trichopria (Planopria) sp.

Reared from pupae of *Paratheresia* sp. from Trinidad, 1934.

FAMILY—FORMICIDAE

Cardiocondyla sp.

Crematogaster brevispinosa Mayr var. **brevidentata** Forel

Acrobatic ant.

Cremastogaster (Orthocrema) brevispinosa Mayr

Bores into telephone-wire insulation in Barbados and is found on trees, fenceposts etc.

Monomorium destructor Jerdon

A troublesome house-infesting ant present in many localities in the West Indies.

Monomorium carbonarium F. Smith subsp. **ebeninum** Fabricius

On sugarcane.

Rhizomyrma sp.

Record only.

Solenopsis geminata Fabricius

Fire ant.

Solenopsis corticalis Forel

Attacking eggs, larvae, and pupae of *Clemora (Phytalus) smithi*, under experimental conditions.

Acropyga (Rhizomyrma) marshalli Crawley

From soil around base of cane stool.

Paratrachina longicornis Latreille

Crazy ant.

Brachymyrmex spp.

Record only.

ORDER—HYMENOPTERA (Cont'd)

FAMILY—FORMICIDAE

Camponotus sexguttatus Fabricius
From sugarcane field.

Camponotus (Myrmosphincta) sexguttatus Fabricius var. **grenadensis** Forel.
Found under bark of mahogany tree.

FAMILY—BETHYLIDAE

Perisierola nigrifemur Ashmead
Parasitic on *Pyrocerces coriacella* Snellen.

Rhabdepyris zeae Turner and Waterston
Found in numbers in units breeding *Sitotroga cerealella* Olivier. Not nearly so detrimental as *Habrocytus cerealellae* Ashmead.

FAMILY—VESPIDAE

Odynerus grenadensis Ashmead
Occupies cells of *Sceliphron cementarium* Drury, stocking them with caterpillars.

Ancistrocerus sp.
Habits similar to those of *Odynerus grenadensis* Ashmead.

Polistes annularis Linnaeus
Predaceous on cottonworm.

Polistes bellicous Cresson
Habits similar to preceeding.

Polistes canadensis Linnaeus var. **cinctus** Leys

Polistes fuscatus Fabricius var. **nestor** Fabricius
These records are from J. E. Bequaert, Jour. N. Y. Ent. Soc. **48:** 1–31, 1940.

FAMILY—POMPILIDAE

Anoplius (Arachnophroctonus) Americanus Juxtus Cresson
Record only.

Anoplius (Notiochares) A. Amethystinus Fabricius
Record only.

FAMILY—SCOLIIDAE

Campsomeris dorsata Fabricius
Parasitic on larva of *Ligyrus cuniculus* Fabricius

ORDER—HYMENOPTERA (Cont'd)

FAMILY—TIPHIIDAE

Myzine (or **Elis**) **ephippium** Fabricius

Tiphia parallela Smith

Parasitic on larva of *Clemora* (*Phytalus*) *smithi* Arrow.

FAMILY—SPHECIDAE

Chlorion (**Ammobia**) **dubitatum** Cresson

Burrows in marlholes.

Motes luteipennis Cresson

Burrows in marlholes.

Motes vinulenta Cresson

Burrows in marlholes.

Sceliphron cementarium Drury

Makes mud nests in outbuildings.

Tachytes argentipes Smith

Once observed in the act of catching a small grasshopper.

FAMILY—HALICTIDAE

Halictus cyaneus Ashmead

Record only.

FAMILY—MEGACHILIDAE

Megachile barbadense Cockerell

Record only.

Megachile binotulata Dalla Torre

Leaf-cutting bee.

Megachile concinnata Smith

Record only.

FAMILY—APIDAE

Apis mellifera Fabricius

Honeybee.

Hemisia versicolor Fabricius

Record only.

Hemisia sp.

Occupied nests of *Sceliphron cementarium* Drury, which it stores with a mixture of honey and pollen.

Xylocopa brasilianorum Linnaeus

Builds in decayed branches, posts etc.

Xylocopa fimbriata Linnaeus

Builds in old posts, old tree branches etc.

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